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DISTRIBUTION ENGINEERING DEPARTMENT
OVERHEAD STANDARDS & PLANNING

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**TRENCHING REQUIREMENTS FOR CONDUIT AND EQUIPMENT STRUCTURE
FOR
UNDERGROUND RESIDENTIAL DISTRIBUTION (URD) ELECTRIC SYSTEM**

FILE: CONSTRUCTION STANDARDS MANUAL NO. 3, SECTION 16
FIELD MANUAL NO. 22, URD, SECTION 2 CABLES

TARGET AUDIENCE	ELECTRIC OPERATIONS – URD CONSTRUCTION REGIONAL ENGINEERING
NESC REFERENCE	SECTION NO. 32 and 35

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1.0 **PURPOSE**

This specification describes the criteria for using High Density Polyethylene (HDPE) conduit and fittings suitable for the Underground Residential Distribution (URD) System. This includes primary, secondary, streetlight cable as well as the pads, splice boxes, vaults, and related accessories required to support URD electrical equipment, including radial pad-mounted transformers.

This specification also provides clearance guidance to install conduits between private property and joint trenches shared with electric, gas, water, sewer and communication lines.

For Non-URD Systems, refer to EO-3039, "General Guidelines for the Installation of Direct Buried High Density Polyethylene (HDPE) Conduits in Primary Underground Cable Systems, Excluding Underground Residential Distribution (URD) Systems."

2.0 **APPLICATION**

This specification applies to all Operating Regions, except Manhattan.

3.0 **GENERAL REQUIREMENTS**

- 3.1 High Density Polyethylene (HDPE) is approved plastic conduit material for all URD applications except within 35' of steam facilities. Steel, Pre-cast concrete and Fiberglass materials are also approved in accordance with [EO-1032](#).
- 3.2 HDPE conduits may be installed using open-trench following specs Drawing [304963](#). Care shall be exercised to prevent the induction of foreign material into conduits and bend sections.
- 3.3 On Private property, construction of URD equipment with cables in conduits shall be in accordance with the latest PSC mandates as incorporated in [EO-2055](#) and [EOP-5307](#). Construction must conform to Company specs when between Point of Service Determination and the meter.
- 3.4 Before digging, Dial 811 Dig Safe New York (formerly the One-Call Center and **New York State Industrial Code 753**) or call 1-800-272-4480 for NYC and Long Island and call 1-800-962-7962 for Westchester to prevent accidental dig-ups.

4.0 **APPROVED CONDUIT MATERIALS**

- 4.1 **HDPE** shall meet requirements of [EO-4379](#), and components shall be installed as per [EO-3036](#). HDPE is to be used in general except for road crossings and transitions to equipment of different material as in [Dwg 304963](#).
- 4.2 **Steel** shall meet requirement of [CE-TS-4197](#) and be installed as per [EO-8014](#). Minimum 4" conduit is required for crossing road ways / parking lots, jacking or driving operations, open trench with unstable soil, or in shallow trench as per clearances in [EO-14903-C](#).
- 4.3 **Precast concrete** shall meet requirements of [EO-1042](#) and components shall be installed in accordance with [EO-8007](#), for transition to conduit and equipment of different material as per [EO-9508-C](#) and [EO-7907-D](#).

5.0 **TRENCHING METHOD**

- 5.1 Trench shall be excavated with minimal cover of 24" over the upper most conduits. The bottom of the trench shall be graded smooth and tamped to minimize initial settlement and to avoid "point" support of conduits. All stones projecting into the trench bottom shall be removed, and the voids backfilled before conduits are placed. Where streets or sidewalks are not to final grade, the cover shall be measured from the final grade, or the existing grade, whichever provides the deeper trench. If due to subsurface conditions the cover is less than 20", but never less than 18" on private property (also see corresponding specifications in [Electric Blue Book](#) for when customers are performing work), the conduits shall be protected by 3/8" thick steel protective plates, 4' long, and the same width as the trench. Adjacent plates shall overlap by a minimum of 2".
- 5.2 Backfill of conduit shall be in accordance with [EO-1181](#), [EO-8085](#), and [CEHSP S13.00](#). A warning tape (C/S #024-6496) shall be laid continuously in the trench 12" below final grade. Where possible, a 4" layer of clean, well tamped backfill Type "I" as per [EO-8085](#), shall be provided between the plate and top of the upper most conduits.

6.0 **INSTALLATION OF CONDUIT**

- 6.1 Prior to installation, a random inspection of conduit sections shall be made with a mandrel in accordance with specification [EO-16734-B](#), Test Mandrel for Four-Inch and Five-Inch Conduits.
- 6.2 The conduit shall be laid in as straight an alignment as possible maintaining concentric bores and flush joints to permit smooth and easy pulling of cable. Standard HDPE bends (or coilable HDPE conduit) shall be used in all cases where alignment changes are necessary. Field bending of the HDPE conduit is acceptable for bends with a radius greater than 15 times the outside diameter of the conduit and when done as recommended by the conduit manufacturer as per [EO-3039](#). All bends shall be laid out so that they are tangent at the point of joining.
- 6.3 The conduits shall be laid in the trench in the recommended formation specified on drawing [Dwg 304963](#) and as directed by specific layouts. When changes in the formation of a bank of conduits within a run are necessary the transition shall be accomplished in as straight an alignment as possible maintaining continuous earth support under each conduit.
- 6.4 Conduit shall be prepared with cable pulling lines as per [EO-1063](#), Preparation of Conduit for Cable Installation, shall be followed prior to the installation of distribution cable into underground conduit systems. HDPE Conduit ends that do not terminate inside a manhole must be closed with duct-plugs as shown on drawing [EO-10864-D](#), Molded Plastic Plug for Conduit. These plugs should be installed at the end of each work shift to prevent the entry of foreign. Methods used to clean the HDPE conduit must not damage the smooth bore of the pipe. All conduit damaged during installation must be replaced.

7.0 **REPLACEMENT OF CONDUIT**

- 7.1 Vacant HDPE conduits found damaged or impaired shall be replaced with new conduit meeting specification requirements.
- 7.2 Precast, field-split, concrete conduits shall replace HDPE conduit that have been removed from around existing cables in accordance with [EO-8007](#), with a max run of 75'.

8.0 **JOINT TRENCHING CLEARANCES**

- 8.1 Trenching involving gas shall comply with 16 NYCRR Part 255 Sections 325 and 361, CI-920-I, & Gas Engineering specifications [G-8100](#) and [G-8005](#) as per table below:

Subsurface Facility	Gas Service	Gas Main - Distribution	Gas Main - Transmission	With Phenolic Board
Electrical Ducts	4"	6"	12"	2"
Direct Bury Cable (URD)	12"	12"	12"	2"
Transmission Electric (Oil-o-static)	12"	12"	12"	6"

- 8.2 For instances where the minimum clearance between electrical and gas facilities cannot be met, either facility shall be relocated or a Phenolic board shall be installed (C&S# 596-4473 for 1'x2' or C&S# 596-4432 for 1'x4').
- 8.3 For instances where exposed electric conduit is found to be deteriorated, the presence shall be to repair the situation via installation of split duct (C&S# 005-1987). If the cable is found damage, the cable shall also be replaced prior to the repair of the conduit.
- 8.4 Installation of phenolic board and repairs to conduit shall be updated on the "Gas and Electric Clearance Mitigation Report" on the Con Edison Intranet as per [CI-920-I](#).
- 8.5 Where gas mains/services run parallel to electric transmission lines (Oil-O-Static) for significant distances, contact electric transmission for guidance.
- 8.6 Trench spacer bracket for separation of gas and electric conduit is also approved as per Gas Tools committee and is available as below:

Size	Class & Stock #
1" - Service	003-1624
2" - Service	003-1625
2" - Main	003-1626
4" - Main	003-1627

- 8.7 A minimum separation of 12 inches shall be maintained between Company electric and other underground facilities: water, sewer, petroleum, steam, telephone, and cable, etc. Where water services run parallel to electric lines for significant distances, maintain 10' of separation, otherwise contact distribution engineering for guidance.
- 8.8 Refer to Figure 3 of **ATTACHMENTS** for location of utilities in the joint trench.

9.0 EXCAVATION FOR URD VAULTS, SPLICE BOXES, AND TRANSFORMER FIBERGLASS BOX PADS

- 9.1 Excavation for installation of URD box pads, subsurface fiberglass vaults, and splice boxes shall be located on the side lot line between homes whenever possible. Service Conduit shall not originate from the URD transformer; instead, service conduit shall originate from the splice box.
- 9.2 Excavation for subsurface transformer ("Silo") structures shall be in accordance drawing [EO-12833-A](#) and Figure 2 in **ATTACHMENTS**.
- 9.3 Excavation for box pad and shall be in accordance with drawing [EO-15351-B](#) and [EO-16348-A](#) and Figure 2 in **ATTACHMENTS**. This box pad shall be oriented to face the street to facilitate troubleshooting.
- 9.4 When field conditions or development layout / plot plan preclude the installation of fiberglass transformer vaults between the curb and the customers property line, a precast concrete vault with vented gratings (Drawings # [305154](#), [305160](#), & [305200](#)) shall be placed in the street at minimum 12" away from the curb. The concrete vault shall be installed a minimum of 4' away from driveways.
- 9.5 Service conduit shall extend from property line / splice box up until the designated point of service termination and shall be in accordance with the [Electric Blue Book](#).

10.0 CABLE INSTALLATION IN URD

- 10.1 All primary cable shall be jacketed with full capacity concentric neutral as per specification [EO-17](#), [EO-21](#), and [EO-2038](#). Primary cables shall be installed in 4" or 5" nominal diameter conduit.

- 10.2 All secondary cable shall meet specification of [EO-19](#) and [EO-22](#) and be installed in 4" nominal diameter conduit.
- 10.3 HDPE conduit and fittings are suitable for primary, secondary, and services in URD as per [EO-1032](#), "Electric Service Conduits for AC Secondary Services".
- 10.4 Streetlight services shall be installed in a 2" nominal diameter conduit as per [EO-5830-C](#).
- 10.5 To facilitate cable pulling, prevent conductor damage and allow for practical maintenance of cable, installation of splice boxes or other structures shall be installed so that span length should not exceed maximum of 450 ft. All other requirements shall follow [EO-1090](#), "Safe Pulling Lengths for Cable".

11.0 **ATTACHMENTS**

Figure 1: General Trenching

Figure 2: Conduit and Equipment Structure Trenching

Figure 3: Joint Trenching

12.0 **REFERENCES**

- 12.1 "Trenching and Tunneling Near Trees: A Field Pocket Guide for Qualified Workers" by Dr. James R. Fazio, The National Arbor Day Foundation:
<https://www.arborday.org/programs/treeLineUSA/standards.cfm>
- 12.2 The following specifications are listed for reference purposes:

<u>Spec No.</u>	<u>Title</u>
EO-17	Purchase and Test Specification for Shielded Power Cables 5-35kV
EO-19	Specification for Cross-Linked Polyethylene(XLP) Insulated Abrasion Resistant Cables 600 Volts
EO-21	Purchase Specification for Shielded Distribution Cable used in Non-Network Applications rated 5-35kV

<u>EO-22</u>	Purchase Specification for Underground Distribution Cable Rated 600V for URD and Non-Network Applications
<u>EO-1032</u>	Electric Service Conduits for AC Secondary Services
<u>EO-1042</u>	Precast Concrete Conduit
<u>EO-1063</u>	Preparation of Conduit for Cable Installation
<u>EO-1066</u>	<i>Obsoleted.</i> Trenching Requirements for Installing URD Cables in Conduit and Joint Trenching
<u>EO-1090</u>	Safe Pulling Lengths for Cables
<u>EO-1100</u>	Sealing of Service Ducts, Entrance and Bus Openings in Electrical Distribution Structures
<u>EO-1136</u>	<i>Obsoleted.</i> General Requirements of use of high density polyethylene (HDPE) conduit in Underground Residential Distribution (URD) developments and other limited applications
<u>EO-1181</u>	General Specification for Backfilling of Trench and Small Openings
<u>EO-2055</u>	A.C. Services
<u>EO-2038</u>	Cables Specified for Underground Feeders
<u>EO-2083</u>	Primary Design of 2.4kV & 7.6kV URD Systems
<u>EO-2742-C</u>	Steel Pipe Bends & Sleeves for Electrical Conduit
<u>EO-3036</u>	Installation of Direct Buried High Density Polyethylene (HDPE) Conduit
<u>EO-3039</u>	General Guidelines for the Installation of Direct Buried HDPE Conduits in Primary U.G Cable Systems, Excluding URD Systems.
<u>CE-TS-4197</u>	General Purchase Specification for Steel Pipe for electrical Facilities and Casings
<u>EO-4379</u>	Performance Specification for Polyethylene (HDPE) Conduits

<u>EO-5307</u>	Policy for the Installation of Underground / Overhead facilities and PSC reporting requirements
<u>EO-5571-B</u>	Typical Installation -1,2 or 4 Duct Electric Subway with 2- 12in Gas Main in Common Trench
<u>EO-5830-C</u>	Service Conduit for City, Local Municipality, or Customer Lamppost
<u>EO-6217-C</u>	Method of Sealing Phase Grouped Cables and Conduits for Services, MH's and Vaults
<u>EO-7326-B</u>	Conduit Formations 4" and 5" I.D.
<u>EO-7907-D</u>	Trench Excavation for Precast Concrete Ducts
<u>EO-8007</u>	Installation of Precast Concrete Conduit
<u>EO-8014</u>	Installation of Steel Conduits
<u>EO-8085</u>	General Backfill and Bedding Material for Excavations
<u>G-8005</u>	General Specification for the Installation of Gas Distribution Mains
<u>G-8100</u>	General Specification of Installation of Gas Services
<u>EO-8302-B</u>	Primary and Secondary Cable Risers
<u>EO-9508-C</u>	Entrances and Recesses in Manhole, Distribution Box, and Vault Walls
<u>EO-9799-D</u>	Precast Concrete Conduit Bell End with Thick Male End
<u>EO-9947-D</u>	Adapter Type 4H-4K, 5H-5K or 6H-6K to receive plastic coupling and 4", 5" or 6" Korduct Steel or Fiber conduit
<u>EO-10864-D</u>	Molded Plastic Plug for Conduit
<u>EO-12833-A</u>	Installation of Enclosures and Cables for Residential Subsurface Transformer
<u>EO-14903-C</u>	Trench Excavation for Direct Buried Plastic Conduits

EO-15351-A	Installation of Box Pad, Splice Box and Cables for Mini-Pad-mounted Transformer (URD)
EO-16026-B	Adjustable Splice Box for URD System
EO-16348-A	Typical Installation for Mini-Pad-mounted Transformer
EO-16734-B	Test Mandrel for 4" & 5" Conduits
304963	Trench Excavation for Direct Buried High Density Polyethylene Conduit on U.R.D System
305154	Precast Concrete Enclosures for Residential Subsurface Transformers
305160	S-2MB Modified Rectangular Steel Frame for URD Transformer Enclosures
305200	Special Steel Grating 1'-6"W x 3'-6"L x 0'-5"D for URD Concrete Enclosures
Electric Blue Book	Energy Services- Electric Blue Book
CEHSP S13.00	Excavation and Trenching
16 NYCRR Part 255, Section 325 (a)	Gas Transmission Clearance
16 NYCRR Part 255, Section 325 (b)	Gas Distribution Main Clearance
16 NYCRR Part 255, Section 361 (g)	Gas Service Line Clearance

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<u>REVISION 14</u> A complete revamped of the procedure to focus mainly on conduits, trenching requirements and joint trenching clearances for URD System. Changed Title. Re-organized and streamlined sections. Added new Section 8.0 on Joint Trenching Clearances Updated spec references and figures.	<u>FILE</u> Construction Standards Manual No. 3, Section 16: URD Field Manual No. 22, URD, Section 2: Cables
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Figure 1: General Trenching

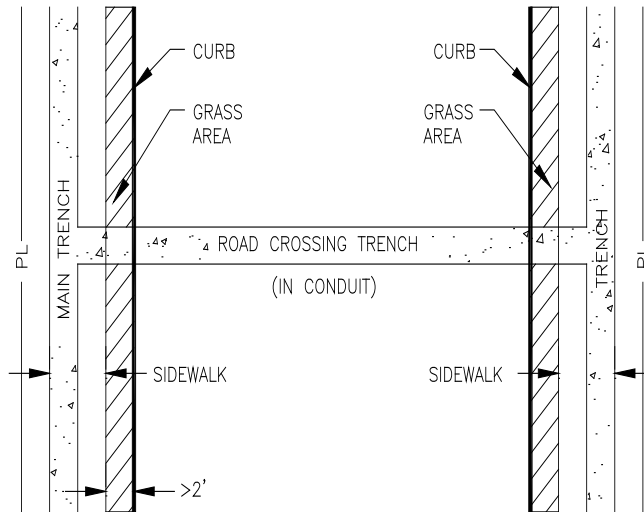


FIG. 1A
PREFERRED MAIN TRENCH LOCATION

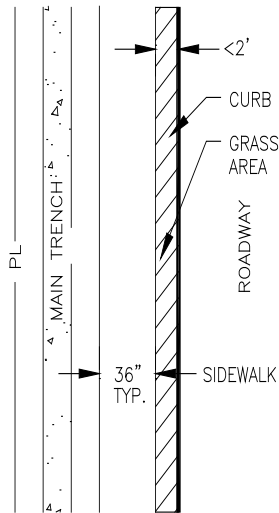


FIG. 1B
ALTERNATE NARROW SIDEWALK CLEARANCE

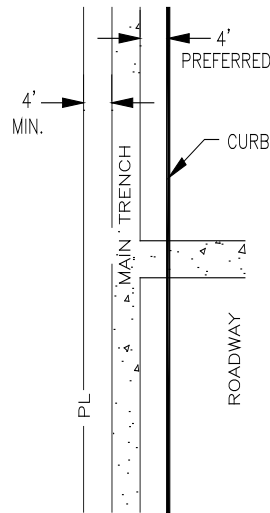


FIG. 1C
ALTERNATE NO SIDEWALKS
NOTE: VERIFY IF EASEMENT EXISTS OR NEEDED.

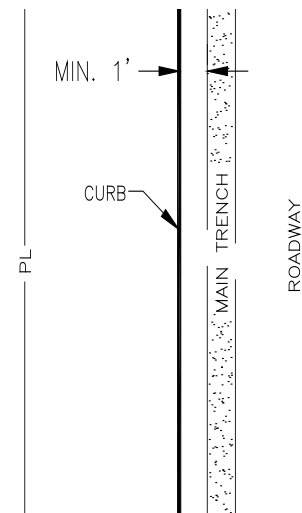


FIG. 1D
ALTERNATE LOCATION IN STREET

Figure 2: Conduit and Equipment Structure Trenching

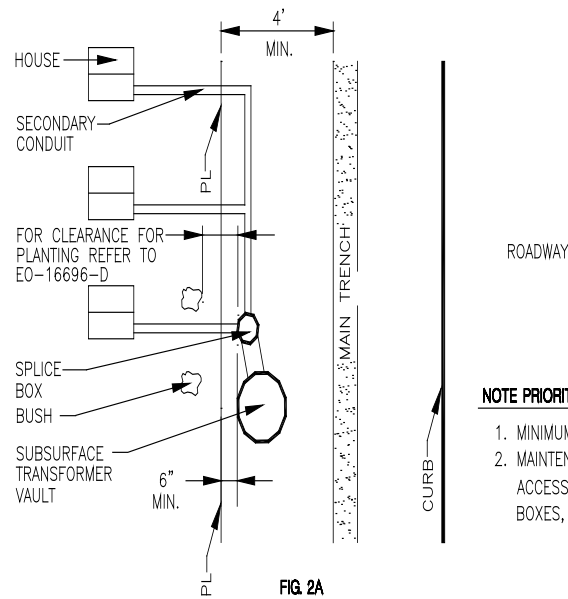


FIG. 2A

LOCATION OF SUBSURFACE ENCLOSURES

NOTE PRIORITY :

1. MINIMUM NUMBER OF 90 DEGREE BENDS.
2. MAINTENANCE ACCESSIBILITY. PROVIDE CLEAR ACCESS TO AND FROM MANHOLES, SERVICE BOXES, PADMOUNTED TRANSFORMERS.

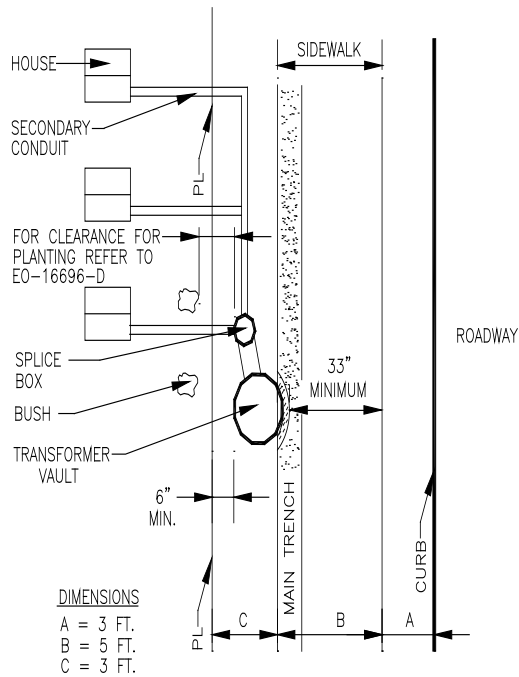


FIG. 2B

ALTERNATE WITH SIDEWALKS

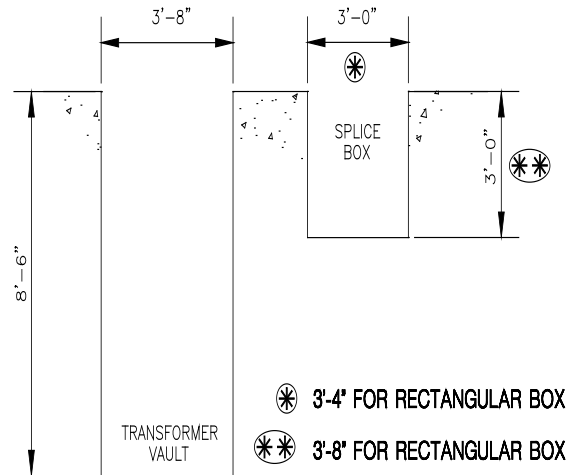


FIG. 2C

EXCAVATION REQUIREMENTS FOR URD VAULTS AND BOXES

NOTE: FOLLOW EO-15351-B.

BOTH ROUND & RECTANGULAR SPLICE BOX ACCEPTABLE.

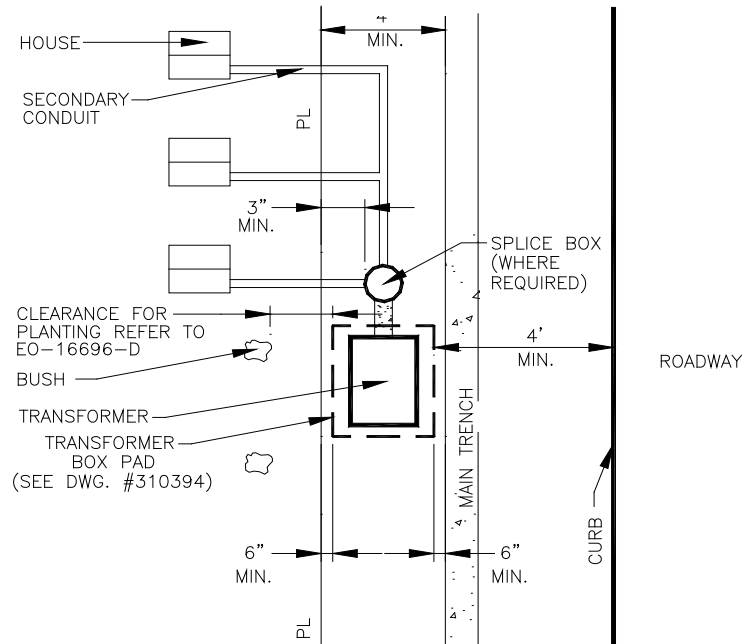


FIG. 2D

(NO SIDEWALK) LOCATION OF PADMOUNTED TRANSFORMER AND BOX PAD

NOTE: FOLLOW EO-15351-B.

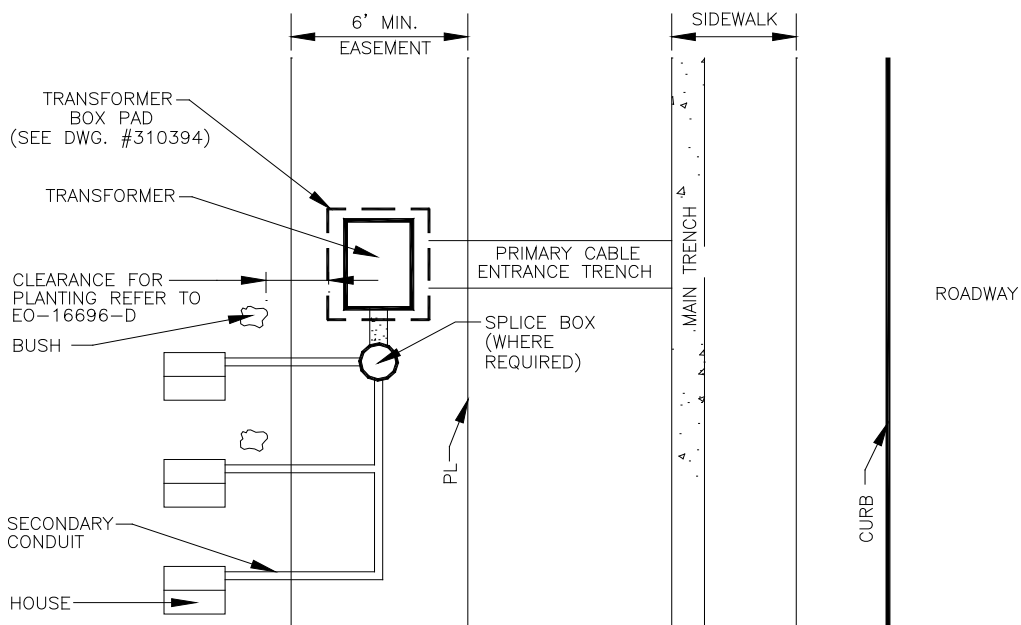


FIG. 2E

ALTERNATE WITH SIDEWALKS

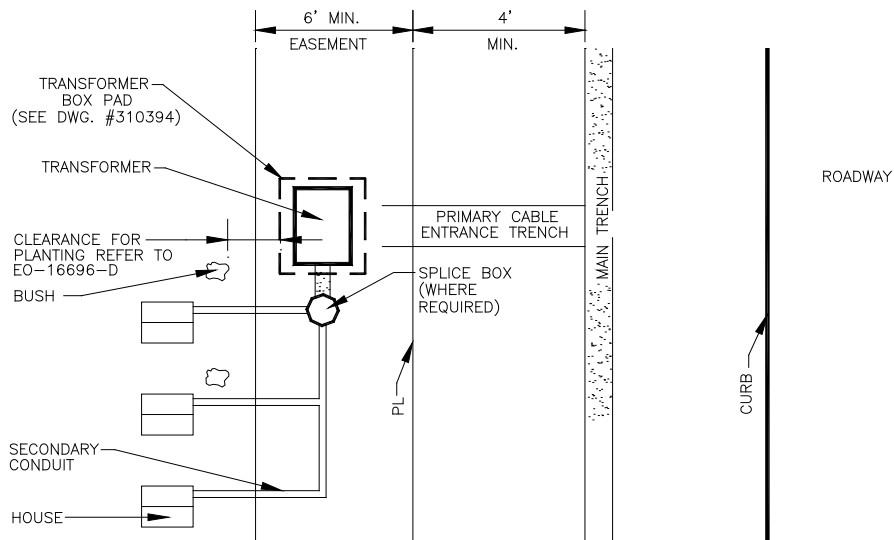
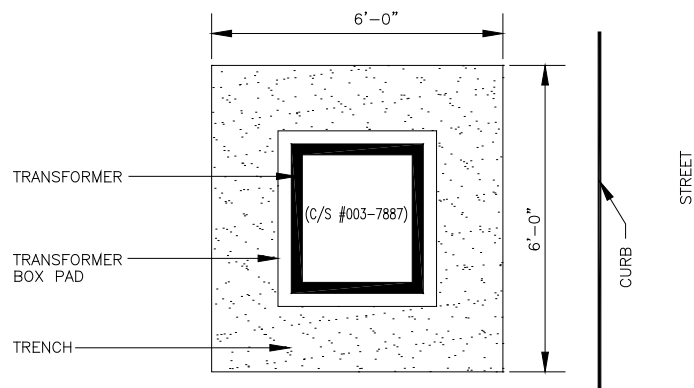


FIG. 2F
ALTERNATE WITHOUT SIDEWALKS



FOR DIMENSIONS OF BOX PADS, SEE DWG. #310394
FOR INSTALLATION OF BOX PAD, SEE EO-15351-A

TOP VIEW

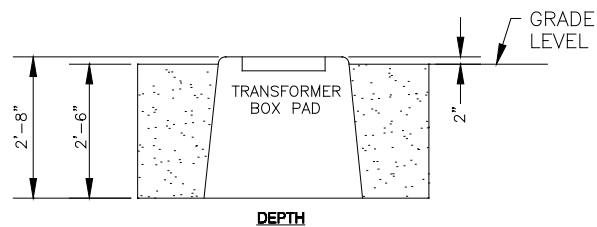
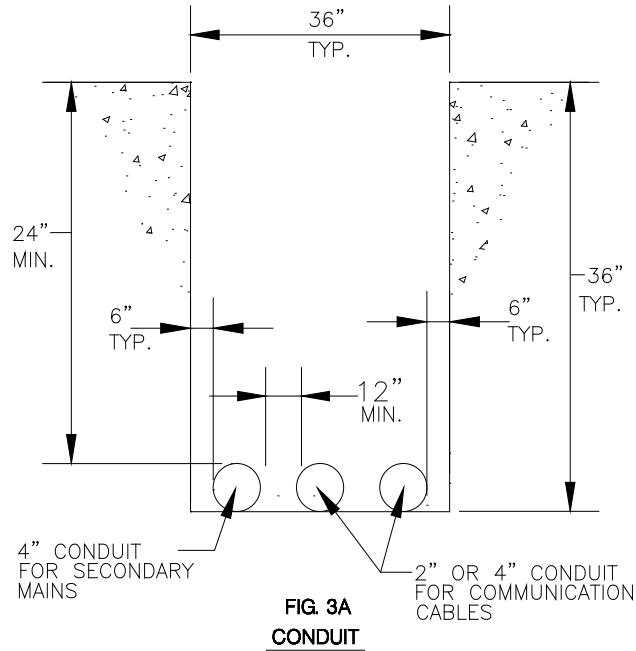
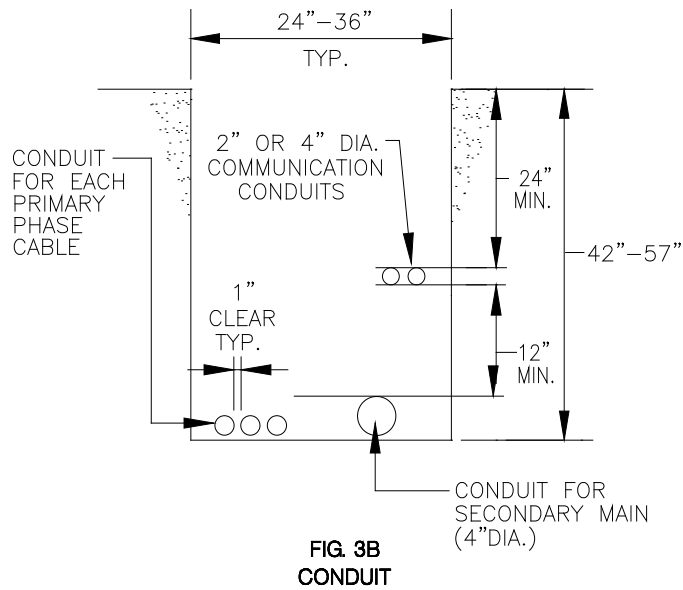


FIG. 2G
EXCAVATION REQUIRED FOR TRANSFORMER BOX PADS

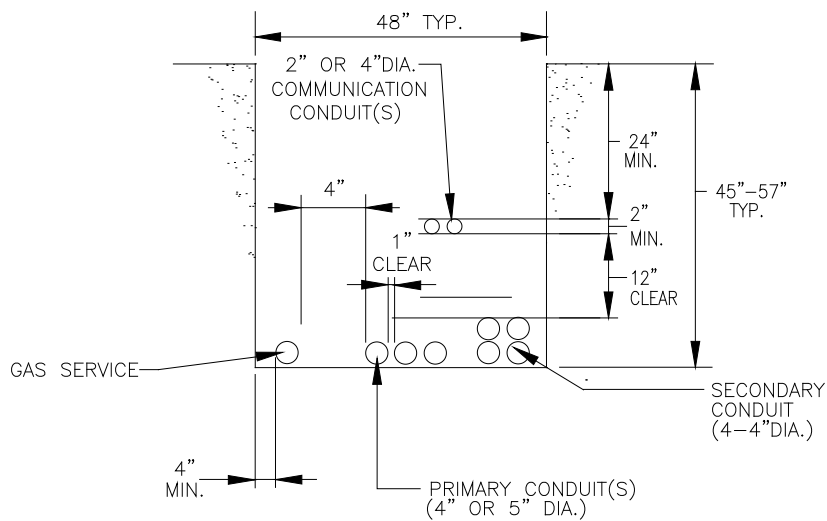
Figure 3: Joint Trenching



**TRENCH SIZE
SECONDARY + COMMUNICATION**



**TRENCH SIZE
PRIMARY + SECONDARY + COMMUNICATION**

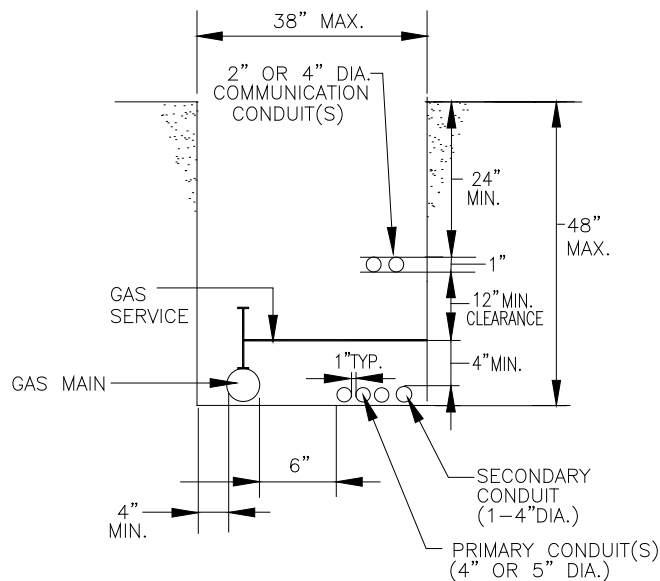


**FIG. 3C
CONDUIT**

TRENCH SIZE

PRIMARY + SECONDARY + COMMUNICATION CABLES + GAS SERVICE

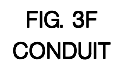
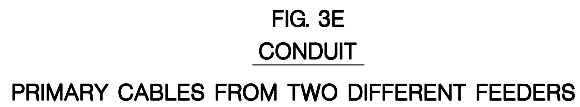
- NOTES: 1. "SECONDARY" DENOTES SECONDARY AND/OR STREET LIGHTING CABLES.
2. TRENCH DEPTHS SHALL BE INCREASED BY FOUR INCHES IN ROCKY AREAS.



**FIG. 3D
CONDUIT**

TRENCH SIZE

PRIMARY + SECONDARY + COMMUNICATION + CROSSING OR LATERAL GAS MAIN WITH SERVICE



Specification	Revision	Rev Date	Effective Date	Copyright Information	Page
EO – 6224	Rev 14	July 2017	9-30-17	@1967-2017 Consolidated Edison Co. of New York, Inc.	19/19
Filing Information			Construction Standards Manual No. 3		
Please consult Distribution Engineering Intranet Site			Distribution Engineering or http://distribution for the current version prior to use.		